Patent
Attorney's Docket No. 154546/0341-073

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
	)	
Marcello PUGGIONI et al.	)	Confirmation No.: 5190
	)	
Application No.: 10/572,170	)	Group Art Unit: 3745
	)	
Filed: January 2, 2007	)	Examiner: Dwayne J. White
	)	
For: HEAT EXCHANGER FOR CENTRIFUGAL COMPRESSOR GAS SEALING	)))	

APPEAL BRIEF PURSUANT TO 37 C.F.R § 41.37

Sir:

Further to the Notice of Appeal filed on August 12, 2010 and in connection with the above-identified application submitted herewith is the Appeal Brief.

(i) **REAL PARTY IN INTEREST**

The real party in interest is the assignee, General Electric Company.

(ii) **RELATED APPEALS AND INTERFERENCES**

To the best of the undersigned's knowledge, there are no related appeals or interferences.

(iii) **STATUS OF CLAIMS**

Claims 1-13 are currently pending, have all been rejected two or more times, and are all the subject of this appeal.

(iv) **STATUS OF AMENDMENTS**

No Amendments have been submitted in this application subsequent to the Notice of Appeal of August 12, 2010. However, after the Final Office Action dated May 12, 2010, a Request for Reconsideration was submitted on ***June 28, 2010*** and entered by the Examiner.

(v) **SUMMARY OF CLAIMED SUBJECT MATTER**

Appellants' claimed invention is directed to a heat exchanger device for a gas seal for centrifugal compressor. The device includes a fluid heat exchanger 3 (see Figure 1) positioned between the gas seal 1 of the compressor 10 and the housing wall of the seal, shown as flange 2, with at least one inlet duct 7 through the fluid heat exchanger configured to supply a blockage gas to the gas seal. During compressor operation the temperature of the gas flowing through the compressor rises as a result of compression, also raising the temperature of the walls/flanges which surround the gas compression area. The compressed gas and/or wall temperatures could raise of the gas seal to the point at which seal materials can degrade or fail (more than 200°C). The fluid heat exchanger is configured such that the heat exchanger keeps the temperature of the gas seal at an acceptably low temperature (100°C). See page 1, lines 23-25, page 2, lines 5-19; page 3, lines 16-18; page 4, lines 13-21; and page 5, lines 16-20.

Further, in order to provide improved cooling effect, the fluid heat exchanger is circular so as to surround the gas seal and extends between the gas seal and a supporting flange for the seal. The fluid heat exchanger includes at least one inlet opening 4 connected to an outlet opening 6 by a coiled path 8, thus a cooling liquid such as water circulates more than one complete rotation around the fluid heat exchanger before exiting the heat exchanger. See page 3, lines 13-22.

(vi) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claim 12 should be rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement; and

Whether claims 1-11 and 13 should be rejected under 35 U.S.C. §102(b) as being anticipated by US patent 5,718,560 issued to Lorenzen (hereinafter Lorenzen).

(vii) ARGUMENT

I. Claim 12 complies with the written description requirement under 35 U.S.C. §112, first paragraph

Claim 12 recites that “the fluid heat exchanger is configured to reduce a temperature of the gas seal from more than 200°C to around 100°C." The originally filed specification states on page 2, lines 5-7, that "[w]hen the temperatures at the compressor delivery are higher than 200°C, there is a sudden perishing of the washers, o-rings and vital parts of the gas seal." The specification then points to the necessity of a device "which creates an acceptable environment for the gas seal in the case of high temperatures." See page 2, lines 17-19. Objectives of the invention are then described as including providing “a heat exchanger device which does not allow the gas seal to reach the temperature of the process gas" and “a device which allows the cooling of the gas seal.” See page 2, lines 21-23 and line 25 to page 3 line 1. Using water circulated through the exemplary device described in the specification "cools the internal surface of the exchanger 3 creating an acceptable temperature (100° C) for the gas seal.” See page 5 lines 16-20.

The original rejection of claim 12 stated that “[t]his range” referring to the configuration of the device to reduce the temperature from more than 200°C to around 100°C “is not explicitly supported by the original specification as filed." In the advisory action the Examiner stated “having the two temperatures mentioned in the specification at different points does not support that heat exchanger claimed by applicants is capable of cooling within that range." The test for determining compliance with the written description requirement of 35 U.S.C. § 112, first paragraph, is whether the disclosure of the application as originally filed “reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subjected matter,” rather than the presence or absence of literal support in the specification for the claim language. *Ralston Purina Co. v. Far-Mar-Co, Inc.*, 772 F.2d 1570, 1575 (Fed. Cir. 1983) (quoting *In re Kaslow*, 707 F.2d 1366, 1375 (Fed. Cir. 1983)). As described above, the application makes clear to an artisan that the claimed invention lowers the temperature of the gas seal to an acceptable level, i.e., around 100°C, from a level that would harm the gas seal, i.e., more than 200°C.

II. Claims 1-11 and 13 are patentable over US Patent 5,718,560 to Lorenzen

A. Independent Claim 1

Independent Claim 1 claims a fluid heat exchanger positioned between the gas seal of the compressor and a housing wall of the seal, with an inlet duct through the fluid heat exchanger to supply a blockage gas to the gas seal, and is configured to keep

the temperature of the seal low in case of high temperatures of the wall and/or compressed gas.

Lorenzen is cited as disclosing a heat exchanger device for a gas seal 15/16 including a fluid heat exchanger 12 positioned between the gas seal and the housing wall 11 capable of keeping the temperature of the seal low. Lorenzen has been misconstrued with respect to the heat exchanger in particular. As shown in figure 2, item 12 is the first stage of a turbo compressor for a non-ideal gas, including the impeller on rotor 12a and diffuser section 12b as shown in figure 3. Lorenzen does include a heating device 18 which supplies heat to “separating wall 19 [that] is provided with ribs 28 for a better heat transfer and for enlargement of the exchange area.” See col. 4, lines 9. Heat is thus supplied to a leakage flow gas to prevent the leakage flow temperature from dropping too low with consequential effects on the dry-gas sliding ring seal during start-up of the turbocompressor. The heat exchanger thus does not act to directly change or control the temperature of the gas **seal** itself, but only acts to directly heat the temperature of the leakage **gas**, as will be further discussed below.

The rejection relies on the assertion that there is no structural difference between Lorenzen and the claimed invention and that the only difference is Applicants’ intention to use a cooling fluid rather than a heating fluid, and the Examiner maintains that Lorenzen is inherently capable of providing a cooling fluid.

The fluid heat exchanger 18/19 of Lorenzen is not configured to keep the

temperature of the **seal** low in the case of high temperatures of the wall and/or compressed gas, but is only and specifically configured to modify the temperature of the leakage flow. Lorenzen teaches the need to heat the gas, not cool the seal, irrespective of the structure of the heater. Even if Lorenzen's heater is capable of cooling the gas, Lorenzen does not describe such a feature, nor how or why such would ultimately cool the seal, thus this rejection does not comply with MPEP 2143.03, which states "[a]ll words in a claim must be considered in judging the patentability of that claim against the prior art." **In re Wilson** 40 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). The Advisory Action's statement that the claim is not to a structural feature different from the structure of Lorenzen is incorrect as discussed below.

Applicants also notes that MPEP 2112 IV states that "[t]he fact that a certain result or characteristic **may** occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic." Further, the MPEP states in the same paragraph that "[t]o establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is **necessarily** present in the thing described in the reference and that it would be so recognized by persons of ordinary skill." (Emphasis added.)

In other words, the standard set forth by MPEP 2112 IV with regard to establishing inherency is that the missing characteristic in the prior art is "necessarily" present in the prior art. The fact that the missing characteristic "may" be present in the prior art is not enough.

In the present application the Examiner has only asserted the heater of Lorenzen is capable of cooling the leakage gas. However, the evidence presented by the Applicants indicates the contrary, Lorenzen only heats and does not cool the leakage gas.

Not only does Lorenzen differ in (1) intent and (2) purpose, i.e., (1) heating rather than cooling, and (2) reducing potential damage from a low-temperature leakage flow at start-up versus maintaining the seal in an acceptable temperature range during compressor operation when exposed to high temperatures from both the compressed gas and surrounding wall, Lorenzen also differs in (3) structure as discussed next.

The heating device 18 of Lorenzen is not located between the gas seal of the compressor 15/16 (or more specifically, 24/25 in Figure 3) and a housing wall of the seal 11 (per Examiner's assertion), but forward of the gas seal so as to heat the leakage gas before it reaches the sliding gas seal 24/25. Note that Lorenzen teaches the sliding gas seal 24/25 and related seal components are held in place by shaft sleeves 20a, 20b, 20c and the seal housing consisting of the outer seal housing 21a, intermediate piece 21b and inner seal housing 21c, which even more particularly points out the structural differences. Even if the first stage of the turbocompressor 12 was considered a heat exchanger as the Examiner suggested, it is not located between the seal 15/16 (24/25) and wall 11 nor actual seal housing components 21a, b, and c.

All of the remaining claims depend directly or indirectly from independent claim 1

and distinguish over Lorenzen for at least the above cited reasons. In addition, additional features further distinguishing claims 2-4 and 6-7 over Lorenzen are discussed below.

B. Dependent Claim 2

Claim 2 further claims that the exchanger is circular suitable for enveloping the seal. The configuration of the heating device taught by Lorenzen includes an inlet 18b and an outlet 18c but the ring shaped heating chamber 18a does not completely envelope the area in which heat is transferred as the ring space 18a is interrupted in the peripheral direction by intermediate wall 29. See col. 4, lines 7 and 21-22, and figures 3 and 4, Figure 4 cut along line IV-IV. Note that Lorenzen's bore 40 is provided in the intermediate wall to supply a blockage gas, while in the present application the analogous supply duct 7 is surrounded by the heat exchanger.

C. Dependent Claim 3

Claim 3 claims the heat exchanger extending between the seal and a supporting flange of the seal. As noted above with respect to claim 1, Lorenzen fails to teach the fluid heat exchanger positioned between the gas seal and the housing wall, thus Lorenzen also fails to teach the more particular arrangement between the gas seal and supporting flange claimed herein.

D. Dependent Claim 4

Claim 4 claims a coiled path between an inlet opening an the outlet opening for

flowing a cooling liquid through the exchanger device. Lorenzen fails to teach a coiled path, but instead as previously discussed teaches a single peripheral path 18a for its heating fluid that is interrupted by intermediate wall 29. A coiled path requires at least one continuously complete rotation around the periphery.

E. Dependent Claim 6

Claim 6 claims the exchanger is configured to receiving a cooling liquid. As noted above with respect to claim one, Lorenzen is configured to heat and only suggest use of a heating fluid to impart heat to the leakage gas flow.

F. Dependent Claim 7

Claim 7 claims the coiled path of claim 4 completely enclosing the gas seal. Lorenzen does not include a coiled path as discussed with respect to claim 4 above, nor a fluid heat exchanger completely enclosing the gas seal, but only has a heat exchanger area in contact with the leakage flow gas.

Conclusions

Appellants respectfully submit that claim 12 complies with the written description requirement under 35 U.S.C. §112, first paragraph, as the originally filed patent application fully supports applicants claimed invention including a fluid heat exchanger configured to cool a gas seal from over 200°C to about 100°C. Applicants further respectfully submit that claims 1 through 11 and 13 are not anticipated by Lorenzen. Reversal of all outstanding rejections is therefore respectfully requested.

Respectfully submitted,
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(viii) **CLAIMS APPENDIX**

1. A heat exchanger device for a gas seal for a centrifugal compressor, the device comprising:

a fluid heat exchanger positioned between the gas seal of the compressor and a housing wall of said seal; and

at least one inlet duct entering through the fluid heat exchanger and configured to supply a blockage gas to the gas seal, wherein the fluid heat exchanger is configured to keep the temperature of said seal low in the case of high temperatures of the wall and/or compressed gas.

2. The exchanger device according to claim 1, wherein said exchanger is a circular exchanger suitable for enveloping said seal.

3. The exchanger device according to claim 1, wherein said exchanger extends between said seal and a supporting flange of said seal.

4. The exchanger device according to claim 1, wherein said exchanger further comprises:

at least one inlet opening; and

at least one outlet opening connected to each other by a coiled path, said path

for flowing a cooling liquid through said exchanger device.

5. The exchanger device according to claim 1, wherein said at least one inlet duct passes through the centre of the exchanger.

6. The exchanger device according to claim 1, wherein the exchanger is configured to receive a cooling liquid.

7. The exchanger device according to Claim 4, wherein the coiled path completely encloses the gas seal.

8. The exchanger device according to Claim 1, wherein the fluid heat exchanger is configured to reduce a temperature of the gas seal.

9. The exchanger device according to Claim 1, further comprising:

a shaft configured to rotate inside the fluid heat exchanger.

10. The exchanger device according to Claim 9, further comprising:

an impeller attached to the shaft.

11. The exchanger device according to Claim 10, further comprising:

a centrifugal compressor including the impeller.

12. The exchanger device according to Claim 1, wherein the fluid heat exchanger is configured to reduce a temperature of the gas seal from more than 200°C to around 100°C.

13. The exchanger device according to Claim 6, wherein the cooling liquid is water.

(ix) **EVIDENCE APPENDIX**

None.

(x) **RELATED PROCEEDINGS APPENDIX**

None.